

ORNITHOLOGICAL LITERATURE

A COMPARATIVE LIFE-HISTORY STUDY OF FOUR SPECIES OF WOODPECKERS. By Louise de Kiriline Lawrence. Ornithological Monographs No. 5, American Ornithologists' Union, 1967: 156 pp., 33 graphs and line drawings, 15 tables. \$3.75 (\$3.00 to members of the AOU).

To study life histories of woodpeckers requires special dedication. Because each pair needs a large area for its support, nests tend to be widely scattered and not easy to find in numbers. The nest holes are often high in dying or dead trees, difficult or dangerous to climb. Even if they can be reached, special procedures are necessary to reveal the contents of the deep, poorly lighted cavities. Despite these obstacles, the woodpeckers, highly specialized anatomically yet remarkably versatile in foraging habits, exert a peculiar fascination on those who become intimately acquainted with them. Among the dedicated students of woodpeckers are Thomas R. Howell, Lawrence Kilham, William E. Ritter, Althea R. Sherman, and James T. Tanner in America; Dieter Blume and Heinz Sielmann in Europe. To this list must now be added the authoress of the present monograph.

This work presents detailed accounts of the general behavior and breeding of four species: Yellow-bellied Sapsucker (*Sphyrapicus varius*), Yellow-shafted Flicker (*Colaptes auratus*), Hairy Woodpecker (*Dendrocopos villosus*), and Downy Woodpecker (*D. pubescens*). All four were studied in the mature, second-growth, mixed forest surrounding Mrs. Lawrence's home at Pimisi Bay in central Ontario, Canada, where in a single day 40 to 50 individuals might visit the feeding station situated amid their territories. Intensive observations of these woodpeckers covered seven of the 25 years during which they were banded and their activities recorded. The banded woodpeckers included 13 sapsuckers, 77 Hairies, and 60 Downies. Some 800 hours of concentrated observation, sometimes continued from dawn to dusk, went into this study.

The Hairy Woodpeckers were resident in the study area throughout the year. Although at first all the Downies were migratory, after the feeding station had been in operation for 14 years some stayed through the winter. The sapsuckers and flickers always migrated. Whether stationary or migratory, all the pairs under observation remained mated for life. This matrimonial fidelity seemed to result not so much from personal attachment of the partners as from faithfulness to the territory; the pair-bond was renewed at the outset of each breeding season. A distinction is made between the "territory" and the "territorial range." The former, a space from about 40 to 100 feet in diameter encircling the potential or actual nest tree, is defended not only against other woodpeckers of the same species but against all intruders which might interfere with the privacy of the resident pair or the rearing of their family. The "range," which includes the "territory," is the much larger area over which the pair forage. From five to eight acres in extent in the sapsucker and the two species of *Dendrocopos*, it has flexible boundaries that are not consistently defended, and it is shared with woodpeckers of other species. Contrary to published statements, Mrs. Lawrence found that the paired male and female of the Hairy Woodpecker normally occupied the same territory throughout the year.

Although the female Downy usually chooses the nest site, in the other three species the male commonly does so; and in all four species he takes the major share in excavation, incubating, feeding the young, and cleaning the nest. He alone stays with the eggs and nestlings during the night, as is usual in the woodpecker family with the

exception of a few tropical American species in which the mated pair sleep in the same hole at all times. The nestlings' meals are much more widely spaced in the flicker, which feeds by regurgitation, than in the other three species, which feed directly from the bill. Incubation periods of these three species ranged from 11 to 13 days, which agrees closely with other determinations for the smaller woodpeckers in both the temperate zone and the tropics. Nestling periods were 20 to 22 days in the Downy and from 25 to 30 days in the three larger species. Parents continued to give some food to the fledglings for one to two weeks after nest-leaving in the sapsucker, slightly longer in the Hairy, and up to three weeks in the Downy. This is much shorter than the period of parental care in certain tropical woodpeckers, which may continue for two months after nest-leaving, as in the small Golden-naped Woodpecker (*Tripsurus chrysauchen*) of southern Central America.

These are only a few of the highlights in a report in which a wealth of detailed information and thoughtful interpretation is presented in a clear, forceful style pleasant to read.—ALEXANDER F. SKUTCH.

MECHANISMS OF ANIMAL BEHAVIOR. By Peter Marler and William J. Hamilton III. John Wiley and Sons, Inc., New York, 1966: 6½ × 9¼ in., xi + 771 pp., many figs. \$14.95.

The last decade has seen a tremendous growth of interest in the field of animal behavior. One direct consequence of this has been the addition of courses in behavior to the zoology curricula of numerous colleges and universities. The development of such courses, however, has been hampered by a lack of suitable texts to supplement lecture material. With the appearance of Marler and Hamilton's book, "Mechanisms of Animal Behavior," this deficiency has been at least partially overcome.

The book is an outgrowth of lectures given in Peter Marler's animal behavior course at the University of California, Berkeley. It covers an extremely broad spectrum of topics which, for convenience, can be grouped into four major sections. The first stresses the interplay of exogenous and endogenous factors in controlling various behaviors. This theme, which recurs throughout the book, is well illustrated in chapters discussing the control of locomotor activities, feeding and drinking behavior, circadian rhythms, and reproductive cycles.

This is followed by a group of chapters concerned with external stimuli and stimulus filtering. The basic principles of ethology laid forth by Lorenz in "Der Kumpan in der Umwelt des Vogels" (1935. *J. Ornithol.* 83:137-213; 289-413) and Tinbergen in "The Study of Instinct" (1951) are presented here along with numerous examples of the use of chemical, visual, and auditory cues in inter- and intraspecific communication. Throughout this discussion, appropriate emphasis is placed upon the adaptive function or selective advantage of different behavior patterns. In addition, considerable space is devoted to problems of sensory physiology and psychological studies of visual and auditory preception. This integrated approach allows valuable correlations to be made between the capabilities and limitations of various sensory receptors on the one hand, and the types of stimuli effective in different communication systems on the other.

The next four chapters discuss experimental studies of animal orientation and navigation. This section, contributed by W. J. Hamilton III, provides a fairly complete, up-to-date review of such topics as gravity detection in invertebrates, echolocation by bats, and celestial, topographic, and possible magnetic orientation by birds.